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THE CONTRIBUTION OF INTELLIGENCE TESTS TO EDUCATIONAL GUIDANCE IN HIGH SCHOOL¹

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Educational guidance has become one of the pressing problems in high-school administration. This is natural in the light of the great changes in the purpose and scope of the high school. The secondary schools a few decades ago received pupils almost entirely from a few select classes. The aim was chiefly college preparatory and cultural. The course of study was uniform, prescribed, and gave little opportunity for electives. The modern high school, on the other hand, draws its students from every class and attempts to give training for all vocations. Table I shows the number and

TABLE I
DISTRIBUTION OF STUDENTS BY OCCUPATIONAL GROUPS

CLASS	UNSKILLED LABOR		SEMI- SKILLED LABOR		SKILLED LABOR		BUSINESS		PROFESSIONS		TOTAL	
	Num- ber	Per- cent- age	Num- ber	Per- cent- age	Num- ber	Per- cent- age	Num- ber	Per- cent- age	Num- ber	Per- cent- age	Num- ber	Per- cent- age
Freshman.....	124	8.6	132	9.2	392	28.0	604	42.5	168	11.7	1,420	100
Sophomore.....	40	4.7	45	5.2	265	31.0	376	44.3	127	14.8	853	100
Junior.....	23	3.5	39	6.0	152	23.0	315	47.5	130	20.0	659	100
Senior.....	8	1.6	21	4.4	104	20.8	232	46.2	135	27.0	500	100
Total.....	195	5.7	237	6.9	913	26.5	1,527	44.5	560	16.4	3,432	100

percentage of students from each of five occupational groups including every conceivable occupation. This table is based on the enrolment in the Central High School and the High School of Commerce, Omaha, Nebraska, during the school year 1919-20 and may be taken as representing the typical situation. Every year sees a substantial increase in the number of students enrolled.

¹ Paper presented to the Psychology Section of the Inland Empire Teachers' Association, Spokane, Washington, April 5-7, 1922.

Table II shows the increase in enrolment by five-year periods and the percentage that the high-school enrolment is of the total population as shown by the report of the Commissioner of Education. It is clear that if this rate of increase continues, the proportion of students from each of the five occupational groups will undergo radical changes. A classification of 36,500 soldiers in one of the training camps showed that 20 per cent came from the unskilled and semi-skilled group; 61 per cent from the skilled group; 14 per cent from the clerical and business group; and about 4 per cent from the professions. This probably represents the typical situation in civilian life in most communities. When we reach the ideal of educational leaders, that high-school graduation should

TABLE II
INCREASE IN HIGH-SCHOOL ENROLMENT BY
FIVE-YEAR PERIODS

Year	Enrolment	Per Cent Enrolment Is of Population
1889-1890.....	367,003	0.59
1894-1895.....	539,112	0.79
1899-1900.....	719,241	0.95
1904-1905.....	780,000	1.03
1909-1910.....	1,100,000	1.10
1914-1915.....	1,400,000	1.50
1921-1922.....	2,000,000*	1.80

* Estimated.

be the minimum of educational attainment of public-school children, we shall have a far different occupational distribution than that indicated in Table I. If the high school is to function, it is necessary not only that the entering students be given guidance in accordance with their capacities and talents but that a proper balance be preserved between training and vocational opportunities. Proctor obtained from 930 high-school students a statement of their vocational ambitions. In Figure 1 these are compared with vocational opportunities as indicated by the occupations of the fathers of 3,432 Omaha high-school students. It is clear from this figure that when only 16 per cent of the fathers are in the professions it will not be possible for 61 per cent of the children to enter them. There is not a proper balance, in other words, between

the vocational ambitions of high-school students and vocational opportunities. With increased enrolment the problem will become more accentuated. The need for scientific procedure will become greater. It is the purpose of this paper to show how intelligence tests may be made to contribute to such a procedure.

It has been shown that as high-school enrolment increases, there is a marked change in the proportions coming from the different occupational groups. In the army it was found that there were

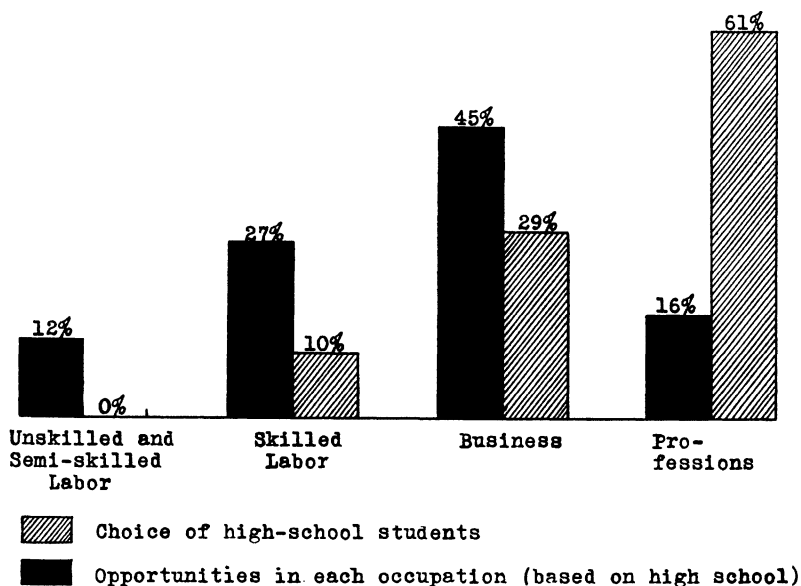


FIG. 1.—Comparison of vocational opportunities with vocational ambitions

important differences in the intelligence of these groups. If these differences exist among students belonging to the various occupational groups, any change in the proportionate distribution in high school would be significant. Table III shows that these differences do exist. This table is based on the Army Alpha Intelligence Test which was given to the Omaha high-school students during 1919-20 by the writer. Table III shows the median point score for each group in each class. In Table IV these scores are reduced to I. Q.'s by dividing the point scores by the age standards obtained by giving this test to pupils in the elementary and high

schools in Minnesota and reported in a bulletin published by the Moorhead State Teachers College.¹ The I. Q.'s thus obtained are not to be taken as the equivalents of the Stanford-Binet I. Q. Their validity will depend on the validity of the age standards. However, since they are based upon a fairly large number of cases in each group, they are probably not far from the true I. Q. They

TABLE III

MEDIAN ARMY ALPHA INTELLIGENCE SCORES BY OCCUPATIONAL GROUPS
IN OMAHA HIGH SCHOOLS

CLASS	GROUP					AGE STANDARDS	MEDIAN AGE
	I	II	III	IV	V		
Freshman	78.8	83.5	93.0	100.6	115.7	92	15-1
Sophomore	81.2	97.1	102.9	113.2	129.4	96	16-0
Junior	98.7	94.3	112.8	119.5	138.1	101	16-10
Senior	120.0	101.2	120.2	125.0	146.2	107	17-11

TABLE IV

MEDIAN INTELLIGENCE QUOTIENTS BY OCCUPATIONAL GROUPS

CLASS	GROUP				
	I	II	III	IV	V
Freshman	86	91	101	110	126
Sophomore	84	101	108	118	135
Junior	97	93	111	119	137
Senior	113	95	114	118	137

also have the advantage of making possible comparisons on the same basis between the four classes. These two tables clearly show that there is a marked relationship between intelligence and occupation of parents. In each occupational group, the median I. Q. increases from the Freshman to the Senior year. This is, no doubt, due to the selection of the more competent at the end of each school year; that is, there is an elimination at the end of each year of failing students. Reference to Table I will show that elimi-

¹ Ward G. Reeder, *Results of the Army Intelligence Tests in Minnesota Public Schools*, p. 17. Moorhead, Minnesota: State Teachers College, 1921.

nation takes place the most rapidly from Group I, which constitutes 8.6 per cent of the enrolment during the Freshman year and only 1.6 per cent during the Senior year. In Group II the elimination is also large, the percentage being reduced from 9.2 to 4.4 between the Freshman and Senior years. Even in Group III there is a consistent decrease in the percentage from year to year. Group IV about holds its own; while Group V shows a gain from 11.7 per cent in the Freshman year to 27.0 per cent in the Senior year. Thus, it would appear that the students in Groups I, II, and III who survive to the Senior year are more highly selected for their group than is the case for Groups IV and V. Nevertheless, the intelligence of the students in Groups IV and V is above that of the lower groups for each year. It thus seems safe to conclude that there are distinct levels of intelligence for the occupational groups in the high school as well as in the army.

That such intelligence levels exist may be shown in another way. Figure 2 shows the spread of intelligence for the middle 50 per cent of the Freshmen in each occupational group. The point scores have been reduced to I. Q.'s as described. While considerable overlapping is shown, distinct levels of intelligence are indicated. No doubt, the differences would be greater if each group included all of the children of high-school age instead of the more select portion. We have seen that the selection has been greater in the lower groups than in the upper groups. Thus we may expect that as more and more pupils are sent on to high school from the elementary schools the intelligence levels of the five groups will differ much more than they do now.

The question may now be raised as to whether there is any relation between intelligence as measured by such tests as the Army Alpha test and the kind of high-school work which a student may profitably undertake. If such a relationship is found, it is evidence that intelligence tests can be used in educational guidance. The question can be answered by making further comparisons between the two Omaha high schools, Central High School and the High School of Commerce. These two schools offer distinctly different types of courses. The Central High School is chiefly college pre-

paratory and classical, and the High School of Commerce is chiefly commercial and vocational. The Central High School draws

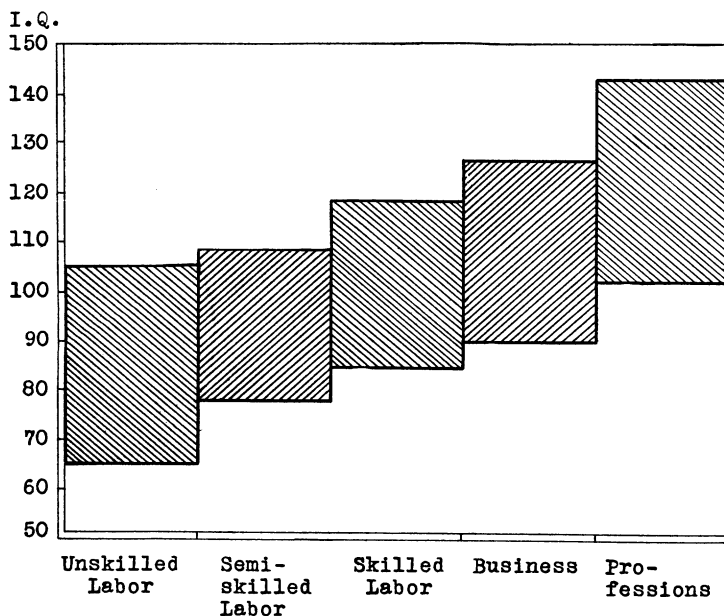


FIG. 2.—Occupational intelligence levels of high-school Freshmen showing spread of middle 50 per cent of cases.

largely from Groups IV and V, while the High School of Commerce appeals more to the pupils from the other three groups. The differences in the occupational groups represented in these two

TABLE V
PERCENTAGE OF STUDENTS IN EACH OCCUPATIONAL GROUP BY HIGH SCHOOLS

SCHOOL	GROUP					
	I	II	III	IV	V	Total
Central High School.....	2.6	3.3	18.5	47.0	28.6	100.0
High School of Commerce..	7.0	10.5	37.0	41.1	4.4	100.0

schools are shown in Table V. The differences in intelligence between the students of these two schools are shown in Tables VI

and VII. Table VI shows how the students of the same age in a given class compare in scores made in the Army Alpha test. It will be noticed that the Central High School students age for age and

TABLE VI
COMPARISON OF POINT SCORES IN ARMY ALPHA TEST

	Chronological Age									
	13	14	15	16	17	18	19	20	21	22
Freshmen:										
Central.....	128	112	110	101	104	100	90	.....	.....	.....
Commerce.....	91	91	86	79	72	.....	.....	.....	.....	.....
Sophomores:										
Central.....	.....	135	129	122	118	123	117	70	.....	.....
Commerce.....	.....	97	107	92	86	85	80	80	.....	.....
Juniors:										
Central.....	.....	.....	130	136	132	123	120	120	120	.....
Commerce.....	.....	.....	97	108	106	93	80	.....	.....	.....
Seniors:										
Central.....	.....	.....	190	150	143	140	129	125	129	115
Commerce.....	.....	.....	.....	130	111	116	103	89	.....	.....
Age standards.....	84	87	92	96	101	107	107	109	.....	.....

TABLE VII
COMPARISON OF INTELLIGENCE QUOTIENTS

	Chronological Age							
	13	14	15	16	17	18	19	20
Freshmen:								
Central.....	152	129	120	104	102	94	.....	.....
Commerce.....	109	104	94	83	71	.....	.....	.....
Sophomores:								
Central.....	.....	154	140	127	117	114	110	.....
Commerce.....	.....	111	115	95	85	79	.....	.....
Juniors:								
Central.....	.....	.....	142	141	130	115	112	110
Commerce.....	.....	.....	105	113	105	86	75	.....
Seniors:								
Central.....	.....	.....	.....	156	142	131	120	115
Commerce.....	.....	.....	.....	136	110	109	97	82

class for class score much higher than the High School of Commerce students. In both schools the younger pupils in a grade score higher than the older pupils, and for a given age the Sophomores score higher than the Freshmen, the Juniors higher than

the Sophomores, and the Seniors higher than the Juniors, which is what one should expect if intelligence is really being measured.

In Table VII the scores in Table VI have been reduced to intelligence quotients by dividing the point scores by the age standards. The advantage of doing this, as has been pointed out, is that it results in a common basis of comparison for the four classes. The differences in intelligence of the pupils in the two schools are still more strongly shown.

From these tables it appears that intelligence tends to seek its proper level in school as elsewhere. The students in the two

TABLE VIII
MEDIAN INTELLIGENCE QUOTIENTS OF FRESHMEN BY SUBJECTS

	Boys		Girls	
	Failed Students	Passed Students	Failed Students	Passed Students
Latin I and II	118	135	116	132
Ancient history	105	132	99	127
English	105	129	93	118
Algebra	111	123	99	124
Manual training		112		
Mechanical drawing	108	110		
Typewriting	76	109	87	96
Woodworking	70	93		
Telegraphy	76	81		
Household arts			94	107
Rapid calculation			66	94
Sewing			76	94
Cooking				83

schools were guided as to their choice of school by their own feelings and judgment, with perhaps some advice from their eighth-grade teachers and from their parents. In spite of this empirical classification most of them found the schools which best fitted their capacities. But it should be possible by the use of intelligence tests to adopt a better method of classification and guidance. There are many students who do not choose the courses best suited to them. That there are different levels of intelligence for the different school subjects is shown in Table VIII.

A more direct answer to the question as to the relationship between intelligence and the kind of work a student may profitably

undertake is given by Table IX. This table shows the median I. Q.'s and the school marks for each class and school. It will be seen that while the intelligence quotients are higher for the Central High School than for the High School of Commerce, the school marks for the High School of Commerce are fully as high as for the Central High School; that is, the High School of Commerce students do the work provided for them and suited to their type of intelligence as well as the Central High School students do the work offered by that school.

This helps to explain the rapid growth of such schools as the High School of Commerce wherever they are established. They

TABLE IX
MEDIAN INTELLIGENCE QUOTIENTS AND SCHOOL MARKS

	SCHOOL MARKS		I. Q.	
	Boys	Girls	Boys	Girls
Seniors:				
Central.....	81.6	85.6	135	125
Commerce.....	83.9	85.2	96	102
Juniors:				
Central.....	79.7	81.6	143	128
Commerce.....	79.6	81.3	105	97
Sophomores:				
Central.....	79.9	81.6	130	128
Commerce.....	80.8	82.0	103	95
Freshmen:				
Central.....	76.2	80.5	113	110
Commerce.....	77.9	82.3	88	89

provide for the needs of a type of students not provided for by the older type of high schools. The point to be emphasized here is that the relationship between intelligence and the kind of work which a student can profitably do is sufficient to justify the use of intelligence tests in educational guidance. Other factors to be considered in the light of facts here presented are existing vocational opportunities and the occupational group to which the student belongs. In addition to these, any other useful information should, of course, be used. A pupil's success in school, temperamental and emotional traits, etc., should be available. All of this information should be obtained and recorded before the completion of the

eighth grade and should be in the hands of those whose duty it is to give advice and guidance to entering Freshmen. To make this concrete, the following is suggested:

1. Name of pupil _____
2. Chronological age _____
3. Intelligence quotient _____
4. Mental age _____
5. Special talents:
 - a) Music _____
 - b) Mechanical _____
 - c) Others _____
6. Will-temperament _____
7. Previous school success _____
8. Vocational ambitions _____
9. Economic and social status _____

Tests are available for securing objective measures in Items 3 to 6 inclusive. These tests should be given and scored by competent persons, and the interpretations should be made by one who has had sufficient training in the interpretation of test results to understand their limitations as well as their advantages.